REMARKS

Claims 125-133, 138, 140-147, 153-162, 167, 169-171 and 173-175 are now pending in the application. Claims 155, 169, 170 and 171 have been amended and claims 173-175 have been added as new. Claims 134-137, 193, 148-152, 163-166, 168 and 172 have been canceled. Support for the foregoing amendments can be found throughout the specification, drawings, and claims as originally filed. The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the amendments and remarks contained herein.

REJECTION UNDER 35 U.S.C. § 103

Claims 125-127, 129, 130, 132, 133, 138, 140-142, 144-146, 154-156, 158, 160, 161, 167 and 169-172 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Cleary et al. (U.S. Pub. No. 2002/0149660) in view of Ostler et al. (U.S. Pub. No. 2001/0046652).

Claims 131, 147 and 162 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Cleary et al. (U.S. Pub. No. 2002/0149660) in view of Ostler et al. (U.S. Pub. No. 2001/0046652), and further in view of Mills et al. (U.S. Pub. No. 2003/0035037).

These rejections are respectfully traversed.

Aspects of Applicant's specification relate to a printer for printing onto a substrate using a radiation-curable fluid, for example, ink. During printing, the fluid is deposited onto the substrate using ink jet printheads, for example. To cause the fluid to cure on the substrate, a radiation source is provided; relative movement of the radiation source

and the fluid on the substrate (in a curing direction) means that the radiation can be applied to all of the emitted fluid, effecting cure across the relevant area of the substrate.

As indicated in the application, for example at page 11 lines 1 to 21 and page 24 lines 10 to 23, problems can arise in conventional arrangements where the radiation source comprises a plurality of radiation-emitting elements. This is because the radiation emitted along the length of the source (perpendicular to the curing direction) varies in such conventional arrangements. For example, the radiation emitted at the element is greater than in a region between two elements. This can lead to a variation in the radiation dose supplied along the length of the source in the direction perpendicular to the curing direction. Thus, as the radiation source and the substrate move relative to each other in the curing direction, strips of the substrate receive different amounts of radiation, leading to variations in the curing and unwanted surface effects, for example lines or stripes in regions of the printed substrate receiving different curing doses can be formed. Thus such arrangements can lead to undesirable print artifacts.

Claim 140 recites "the radiation-emitting elements are arranged in a plurality of rows and such that an element of the radiation-emitting elements is not aligned in the curing direction with any adjacent elements of the radiation-emitting elements." By providing a plurality of rows of elements, where adjacent rows have a different profile of variation in radiation dose along the length of the source, the overall variation in the radiation dose along the length of the source can be reduced, thus reducing the

variation in radiation dose supplied to the substrate, and thus reducing the risk of undesirable print artifacts being formed.

In contrast, the radiation source of Cleary has a single row of elements (for example 24-1) which can give rise to problems indicated above in that there can be a significant variation in the radiation dose emitted along the length of the source perpendicular to the curing direction.

The Examiner has acknowledged that Cleary alone fails to teach or suggest the above mentioned features, but relies on Ostler to cure the deficiencies of Cleary.

Applicant respectfully submits that, contrary to the suggestion of the Examiner, the skilled person would not have considered the teaching of Ostler, and even if he had, there is nothing in Ostler which teaches or suggests the arrangements of examples of the present invention.

Firstly, the radiation sources in Ostler are not for use in a printer, but in the curing of dental composites. Different considerations apply in the curing of printing fluid in a printer and the curing of dental composites in a patient. It is submitted that the skilled person looking to improve the curing of ink in a printer would not have looked to documents relating to the curing of dental composites. For example, the size of radiation sources for curing dental composites are significantly smaller than radiation sources of the type generally used in printers. Also, the size of the substrate on which the curable material is located is many times larger in a printer, compared with the dental composite in a patient. Crucially, it is generally the case in printing that relative movement between the substrate and the radiation source is required during curing for the curing to be completed. There is no indication in Ostler that relative movement

between the source and the dental composite occurs at all during curing. As indicated above, it is this relative movement in a printer which can, in some examples, highlight variations in radiation dose emitted across a radiation source and thus produce undesirable artifacts in a printed image. This problem is not one which is relevant to or addressed by Ostler, and therefore Ostler is not relevant to the present invention, and does not provide any teaching as to a solution to the problem of undesirable artifacts in a printed image. The problems to which Ostler is concerned (and referred to by the Examiner at section 7b of the current Office Action, namely) are not ones which are of particular concern in printing in relation to the present invention.

Indeed, it is further submitted that Ostler teaches away from the present invention. According to examples of the present application, it is advantageous for variations in radiation dose emitted along the length of the source (perpendicular to the curing direction) to be reduced. In direct contrast, in examples of Ostler – see for example Figure 600 and the related description at paragraph [0059] – the arrangement is such that the radiation is focused to a specific "point in space". If such focusing were used in radiation sources for curing printed fluid, it would in many examples give rise to enhanced undesirable artifacts, worsening the problem.

Thus the skilled person would not have considered Ostler when seeking a solution to the problem of undesirable artifacts in the print, and therefore the teaching of Cleary and Ostler cannot be combined.

The Examiner has relied on the combination of the teaching of Cleary and Ostler in all of the claim rejections, and thus it is submitted that all of the pending claims define over the art cited by the Examiner for reasons presented above. In particular, it is

submitted that claim 126, and claim 133 and their dependent claims define over the art cited by the Examiner.

Furthermore, it is submitted that even if the skilled person had considered Ostler, he would not have arrived at the pending claims.

It is submitted that there is no disclosure in Ostler of relative movement between the dental composite and the radiation source, and therefore no "curing direction" as required by claim 140 and thus no teaching of how radiation elements should be arranged in relation to a curing direction. Even if the skilled man had considered mounting the units of Ostler for relative movement in a curing direction (and it is submitted for the reasons given above that he would not), there is no teaching in Ostler as to how those units would be mounted for movement, in particular with regard to their orientation. Specifically, with reference to the unit shown in Figure 1110 of Ostler shown by the Examiner in the Official Action, there is no teaching that the unit should not be mounted such that the aligned LED clusters are in the curing direction. There is no suggestion that one orientation might be preferred over another.

Furthermore, it is noted that in Ostler in Figure 1110 referred to by the Examiner, each LED cluster arranged in a cup (800) includes four LEDs in a rectangular array. Thus, it is not understood how the Examiner considers the units of 1110 might be mounted in a printer without LEDs being aligned with adjacent LEDs in the curing direction. There is certainly no teaching in Ostler on this point. Indeed, the teaching of Ostler is that the LEDs can be arranged in a "square pattern array" (paragraph [0060] of Ostler and shown in Figure 700). It is problems associated with such square arrays that some embodiments of the claims seek to overcome.

Thus, the combination of Cleary or Ostler still fails to teach or suggest that "an element of the radiation-emitting elements is not aligned in the curing direction with any adjacent elements of the radiation-emitting elements" as in claim 140. Thus it is submitted for these further reasons that claim 140 (and its dependent claims) define over Cleary and Ostler.

With regard to claim 155, and as indicated by the Examiner, Cleary does not teach the feature of row of the radiation-emitting elements being offset in a direction substantially parallel to a row.

It is submitted that for reasons given above, the skilled person would not have combined the teaching of Cleary and Ostler and thus claim 155 defines over those documents.

Furthermore, claim 155 as amended includes the feature that the radiation source has an elongate array of radiation–emitting elements in that the width of the array in the row direction is greater than the length of the array in a direction perpendicular to the row direction. Even if the teaching of Cleary and Ostler were combined (and it is submitted that the skilled person would not do so), the skilled person would not arrive at an arrangement in which, in an elongate source, a row of radiation-emitting elements is offset from an adjacent row of elements in a direction substantially parallel to a row.

In a printer, elongated radiation sources are advantageous in emitting radiation to a region of the substrate. For example, the width of the radiation source (for example perpendicular to the curing direction), may be such that a swathe of ink emitted by the printhead in a scan of the printhead over the substrate can be cured in a pass of the

radiation source over the swathe of print. In other arrangements, the radiation source may extend substantially the full width of a substrate being printed so that the ink laid down on the substrate during printing can be cured. It can be a particular problem in providing such elongate radiation sources, that the generation of unwanted artifacts in the printed image can arise as discussed above.

It is submitted that even if the skilled person had considered combining the teaching of Cleary and Ostler (and it is submitted that he would not), he would not have arrived at the invention as defined in claim 155. It is submitted that even if the skilled person had considered the teaching of Ostler and was looking to provide an elongate source, he most likely would have provided an elongate source comprising a plurality of the devices described in Ostler (for example shown in Figure 1110). However, it is further submitted that there would be no particular benefit to be seen in him replacing the individual LED elements of Cleary with the devices of Ostler. Further, even if he had, there is no suggestion in either document to teach him to arrange the devices such that a row of radiation-emitting elements is offset from an adjacent row of elements in a direction substantially parallel to a row as recited in claim 155. Thus it is submitted for these further reasons that claim 155 (and its dependent claims) defines over Cleary and Ostler.

The features relating to the elongate radiation source are also present in claims 170 and 171 and it is submitted that those claims for these further reasons given above define over Cleary and Ostler.

In relation to claim 169, there is no disclosure in Cleary of rows of radiation-emitting elements being offset from each other in a direction substantially parallel to the

row. Furthermore, for reasons given above, the skilled person would not consider combining the teaching of Cleary and Ostler. Therefore, it is submitted that claim 169 defines over the cited art. Even if the skilled person had considered Cleary and Ostler, he would not have arrived at the invention of claim 169 for example for the additional reason that Ostler does not suggest the feature that each row of the plurality of rows of radiation-emitting elements includes substantially the same number of radiation-emitting elements.

As indicated above, in some embodiments of the claims, it is advantageous for variations in radiation dose emitted along the width of the source (perpendicular to the curing direction) to be reduced. This is clearly not the case in the device of Figure 1110 in Ostler identified by the Examiner. It can be seen that the radiation-emitting elements of Figure 1110 are arranged in a circular configuration so that even if the device were moved in a "curing direction" (and it is submitted that it would not be), many more radiation-emitting elements would pass over some areas of a substrate (near the centre of the element) compared with areas at the side or edge areas of the device. Thus such an arrangement may worsen problems of undesirable print artifacts rather than improved them.

By arranging for each row to have a similar number of radiation-emitting elements, variations in radiation dose received by a substrate can be reduced compared with an arrangement such as in Figure 1110 of Ostler.

For these additional reasons, it is submitted that claim 169 also defines over Cleary and Ostler.

NEW CLAIMS

Claims 173-175 are new. Similar considerations apply in relation to new independent claim 173. There is no teaching in Cleary of an arrangement in which each row of a plurality of rows is offset from another row in a direction substantially parallel to the row direction. Furthermore, the skilled person would not combine the teaching of Cleary and Ostler for reasons given above. Even if he had, he would not have arrived at the invention of claim 173, which requires that the array is elongate in that the width of the array in the row direction is greater than the length of the array in the curing direction. Comments in relation to an elongate source are given in relation to claim 155. Furthermore, it is defined in claim 173 that the length of the array is substantially the same along its width.

By arranging the elements in this way, in some examples it is possible to reduce variation in radiation dose applied to the substrate across the width of the source, in particular in comparison with an arrangement such as that of Figure 1110 of Ostler in which the radiation dose emitted at the centre of the device is likely to be significantly higher than that at the sides of the device, leading to a risk of undesirable artifacts being generated. It is noted that in the square array of Figure 700 of Ostler, the LEDs are aligned, contrary to the claims of the subject application.

Thus it is submitted that for these additional reasons, claim 173 defines over Ostler and Cleary. Claims 174 and 175 include further features which distinguish from Cleary in which it is noted that one row of elements is mounted at each side of a printhead arrangement.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Who Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

Dated: April 20, 2009

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